PANEL DISCUSSION:

LEAD AND COPPER IN DRINKING WATER

Sponsored by:
Georgia Section, American Water Works Association

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Panel Discussions:

Population Exposure to Lead and Copper,
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Government Programs Addressing Lead and Copper in Potable Water Supplies,
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Local Implementation of Federal and State Programs,
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Relating Water Test Results to the Public,
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LEAD EXPOSURE IN THE GENERAL POPULATION

by Henry Abadin

Health Effects of Lead

Lead has long been recognized as a toxin, affecting virtually every organ and system of the body. One of the most sensitive target organs is the nervous system. Exposures to high concentrations of lead, particularly in children, can cause encephalopathy and death, whereas exposures to lower concentrations are associated with reduced IQ scores, neurobehavioral effects, and impaired hearing (NAS 1972; Schwartz and Otto, 1987; Bellinger and Needleman, 1983; de la Burde and Choate, 1972, 1975). In addition, lead affects the hematopoietic (Roels and Lauwerys, 1987; Roels et al, 1979) and cardiovascular systems (de Kort , 1987; Coate and Fowles, 1989; Kirkby and Gyntelberg, 1985).

There is evidence that lead also affects the kidneys (Pollock and Ibels, 1986; Huang et al, 1988; Vyskocil et al, 1989), and the immune (Ewers et al, 1982; Hillam and Ozkan, 1986) and reproductive systems (Baghurst et al, 1987; Chowdhury et al, 1984). In fact, spontaneous abortions, sterility, and stillbirths were noted in female lead workers and wives of lead workers as early as the 18th and 19th centuries (ATSDR 1988). Many of the effects noted in humans are supported by data from studies in animals.

Sources of Lead

For the general population, the major route of exposure to lead is ingestion of lead-contaminated water, food, soil, dust, and lead-based paint chips. Soil, dust, and lead-based paint are of particular importance for young children from "pica" (eating of non-food items) and normal hand to mouth activity that results in the ingestion of lead-contaminated dust on the hands.

Although lead is a naturally occurring element that is found in the earth's crust and in all compartments of the biosphere, anthropogenic processes have distributed and concentrated lead in the environment where it has provided a source for human exposure. In 1984, the primary source of lead to the atmosphere was the use of leaded gasoline; however, the phase-down of leaded fuel has reduced the contribution of lead from this source. Despite the phase-down, decades of leaded-gasoline use have resulted in near roadway soil lead levels of 30-2000 $\mu g/g$ above background levels (10-30 $\mu g/g$) (EPA 1986; Mielke et al, 1989).

The overall decline of lead use through the termination of old practices (e.g., leaded gasoline, lead-based paint, leaded solder) has reduced the potential of lead exposure to the general population. However, past use remains a

significant problem for certain populations. For example, an estimated 57 million private housing units built before 1980 still contain lead-based paint. Of these, 14 million are believed to be in unsound condition (HUD 1990). Flaking paint, paint chips, and weathered powdered paint are major sources of lead exposure for young children residing in these homes (Bornschein , 1986; EPA 1986). Improper removal of lead (by burning, sanding, or scraping) from housing known to contain lead-based paint can significantly increase lead levels in dust, an important exposure pathway for small children.

Lead in drinking water occurs primarily from corrosion of lead-containing materials used in the distribution system. The concentration of lead in water depends on the corrosiveness of the water, age and lead content of the materials, and contact time of the water with the lead-containing materials. In 1986, the Safe Drinking Water Act Amendments banned the use of lead solder or flux containing more than 0.2% lead (EPA 1988, 1989b). Because of the wide use of lead solder to connect copper pipes, most public water systems still supply buildings containing lead soldered joints and fixtures. The combination of corrosive water and lead pipes or lead-soldered joints can create localized zones of high lead concentrations that exceed 500 μg/L (EPA 1989a).

The reduction in the use of lead solder in food cans has minimized this as a source of lead exposure for the general population. In 1991, approximately 3.8% of domestic food cans were made with lead solder (Bolger , 1991). Although the number of lead-soldered domestic cans will continue to decline, imported food cans may still contain lead solder.

Other sources of lead exposure include using "non-Western" folk remedies, drinking or eating from lead-crystal decanters and glasses or lead-glazed ceramic-ware, and various hobbies such as making stained glass, using some types of artist's paint, and using firing ranges.

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THE LEAD AND COPPER RULE: A UTILITY'S PERSPECTIVE

By Michael W. Patton

Implementation of the new Lead and Copper Rule published by EPA on June 7, 1991 presents numerous challenges for public water systems. The rule, designed to minimize consumers' exposure to lead and copper in drinking water, establishes an action level for both lead and copper at the customer's water tap. Based upon sampling among high risk homes in the community, the rule requires water systems to take additional action to reduce lead and/or copper levels, including educating the public, if the action levels are exceeded.

Concerns to be addressed by water systems include the selection of sampling sites, completion of public education requirements if action levels are exceeded, and performance of corrosion control studies. Additionally, all of these should be accomplished without diminishing consumer confidence in the water produced by the water system. Ultimately, compliance with this rule requires water systems to develop a plan that results in a carefully coordinated effort involving system employees, customers, the regulatory agency, and the news media.

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